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Systems Engineering Development File

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Presentation Flow

- The need for System Engineering Data Files
- What are System Engineering Development File
- Attributes of a good SEDF
- SEDF Benefits
- Project Life Cycle
- Sample Directory Structures
- Operation
- Experiences
- Future Paths
- Conclusion

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The need for System Engineering Data Files

- **Integrating multifunctional, multidisciplinary, geographically dispersed teams is one of the major tasks facing system engineering.**
  - **Information management is the primary enabler for this task.**
    - **Concerns include availability, accessibility, timeliness, and accuracy of the data.**
- **Sage and Rouse, *Handbook of Systems Engineering and Management***
  - **- Ten Challenges**
    - **Access and Utilization of Information and Knowledge**
    - **Information and Knowledge Requirements**
    - **Information and Knowledge Support Systems**
- **No where are these challenges more apparent than in engineering team building**

Data, Information, and Knowledge creation, maintenance, and distribution- a primary System Engineering Challenge!

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System Engineering Development File

- **The <u>sole objective</u> of the SEDF is to provide an information architecture that is accessible, understood, and used by all to capture and store the pertinent project information.**
- **The information includes all of the system issues, design decisions, and resolutions made during the proposal, development, integration, and test phases**
- **The information may be in the form of notes, records, meeting minutes, action items, etc.**
- **The primary goal of the SEDF is to facilitates the information flow between and among the development team.**
- **A secondary goal of the SEDF is to provide the System Engineer with an Information Management Tool that aids in project development.**

In reality the SEDF is the Project technical management data repository.

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SEDF Attributes

- **Provide a structured, accessible, easy to use repository for capturing design decisions and analysis regarding the product under development;**
- **Provide visibility into system processes, functions, algorithms, architecture, partitioning, implementation and test strategies;**
- **Support requirements management by capturing documentation related to requirements and the traceability of those requirements to the system and other related specifications;**
- **Support risk management by capturing documentation related to critical components, techniques, technologies, and other risks that exist in the system under development;**
- **Support system engineering management by providing a common location to obtain the latest**
- **Adaptable structure for program adaptation**

Single, temporally and functionally partitioned directory structure that spans the program life cycle.

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SEDF Benefits

- Helps bring new people quickly up to speed on the program
- Helps reduce the time required to find “the schedule”, “the budget” etc.
- Helps reduce the frustration of trying to find the proverbial needle in the haystack.
- Aids in establishing preliminary hardware and software specifications;
- Is a source of reference information to support peer, program, and internal reviews;
- Is a source of reference information to support cost, schedule, and budget preparation and tracking;
- Is a repository for minutes, action-item lists, view graph presentations, and other materials from the various reviews;
- Is accessible to all members of the development team.

Logically stored and accessible information saves time, limits frustration, and improves productivity of the development Team.

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Interaction of Engineering and Engineering Management Tasks during a project Life Cycle

	Engineering Tasks				
	Phases: Capture	0	1	2	3
	Pre-Concept Exploration Phase	Concept Exploration	Program Definition / Risk Reduction	Engineering and Manufacturing Development	Production, Fielding/ Deploying
	System Analysis	System Analysis	Conceptual Design	Detail Design	Production Verification
	Requirements Definition	Requirements Definition	Tradeoffs	Development	Op Test
	Conceptual Design	Conceptual Design	Prelim Design	Risk	Deployment
	Risk Assessment	Risk Assessment	Prototyping	Development Test	Operational Support
	Cost & Schedule	Cost & Schedule	Supportability	System Integration	Retirement
				Manufacturing	Replacement Planning
Management Tasks					
Organization					
Schedules					
Polices					
Financials					
Resource Management					
Requirements Management					
Risk Management					
Technique Performance Measurements					
Decision Log					
Trade Studies					
Subcontract Management					
Meetings					
Presentations					
Configuration Management					
Data Items					
Correspondence					

From INCOSE Systems Engineering Handbook Pg 20, Phases in the Project Life Cycle

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Sample Directory Structures

- **Program Big Picture View**
- **Capture Phase**
- **Concept Exploration Phase**

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Interlocking Program Directory Structure

- **Top Level Sample Program**
  - **00 Capture Phase**
  - **01 Concept Exploration**
  - **02 Program Definition**
  - **03 Detail Design**
  - **04 Engineering Development**
  - **05 Production**
  - **06 Fielding**
  - **07 Operational Support**
  - **08 Replacement Planning**
  - **AA Reference Documents**
  - **BB Drop Box**
  - **CC News**

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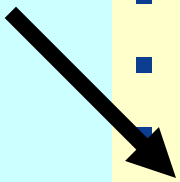
Capture Phase Structure

00 Capture Phase:

- **01 Program Management**
- **02 Engineering Management**
- **03 Contracts**
- **04 Subcontract Management**
- **05 Source Material**
- **06 Proposal Preparation**



- **01 Organization**
- **02 Capture Strategy**
- **03 Schedule**
- **04 Financial**
- **05 Requirements**
- **06 Risk Management**
- **07 Presentations**
- **08 Decision Log**
- **09 Analysis**
- **10 Source Material**
- **11 Engineering Documents**

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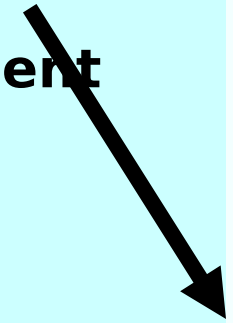
Concept Exploration Structure

- 01 Program Management
- 02 SE Management
- 03 Contracts



- 01 Organization
- 02 Engineering Plans and Schedules
- 03 Policies
- 04 Financial
- 05 Resources
- 06 Requirements
- 07 Risk Management
- 08 Technical Performance Measurements
- 09 Analysis
- 10 Trade Studies
- 11 Decision Log
- 12 subcontract Management
- 13 Meetings
- 14 Engineering Documents
- 15 Data Items

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Capture / Concept Exploration

00 Capture Phase:

- 01 Organization
- 02 Capture Strategy
- 03 Schedule
- 04 Financial
- 05 Requirements
- 06 Risk Management
- 07 Presentations
- 08 Decision Log
- 09 Analysis
- 10 Source Material
- 11 Engineering Documents

01 Concept Exploration

- 01 Organization
- 02 Engineering Plans and Schedules
- 03 Policies
- 04 Financial
- 05 Resources
- 06 Requirements
- 07 Risk Management
- 08 Technical Performance Measurements
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Operation

- Set - up
  - As early as possible
    - Experience has shown that over 90% can be canned.
- Maintenance
  - Index
  - Accessibility
  - Scrubbing
  - Relevance
  - Timeliness
- Disposition
  - Configuration Management

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Experiences

- **Limited number of programs.**
  - **Most Implemented post award**
  - **Only one program from Capture into Concept Exploration**
- **Difficulties**
  - **Not accepted practice – Lead Engineers discretion**
  - **Traditional segmentation between Program Management and Engineering Management**
    - **And between engineering disciplines.**
  - **Newness, lack of familiarity, training.**
  - **Lack of Discipline.**
  - **Information is power syndrome.**
- **Caution – until it becomes habit and really standard practice it will continue to be a problem.**

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Future Paths

- Information Synchronization
  - Work Directories and Final Directors
- Software standardization
  - Common databases
  - Web Browser look and feel
  - Large size file transfer
- Multi-company access
  - Security
- E-mail
  - Project versus personnel email folder?

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Conclusion:

- **Information awareness and availability are essential ingredients in any successful project.**
- **Providing an information architecture where this information can reside and be viewed by the team is one of the keys in turning a good project team into a great project team.**
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- **Providing an information architecture where this information can reside and be viewed by the team is one of the keys in turning a good project team into a great project team**
- **In limited use, the SEDF has proven to be an effective project-level information organizational and distribution tool.**
- **The SEDF has meet its short term objectives of being the information pool from which the developers and specialty engineering personnel can draw the latest and most current project information and post their contributions.**
- **Whether the SEDF can achieve it's long term benefit goals still needs to be verified.**